(No Model.) 2 Sheets—Sheet 1.

J. DRADER & A. B. McKAY.

SPADE HARROW.

No. 487,322. Patented Dec. 6, 1892.

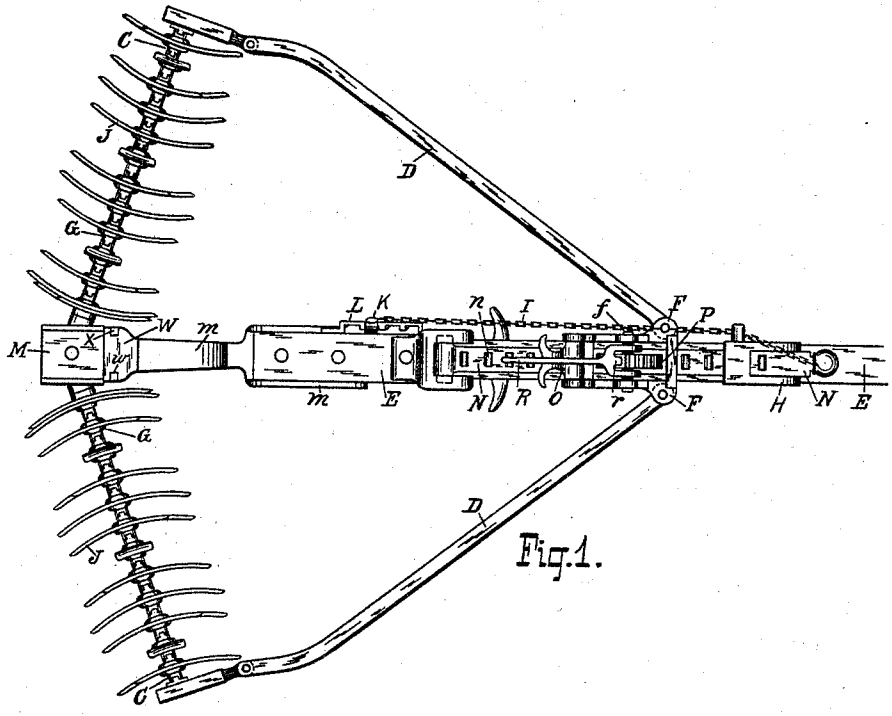

Fig. 1.

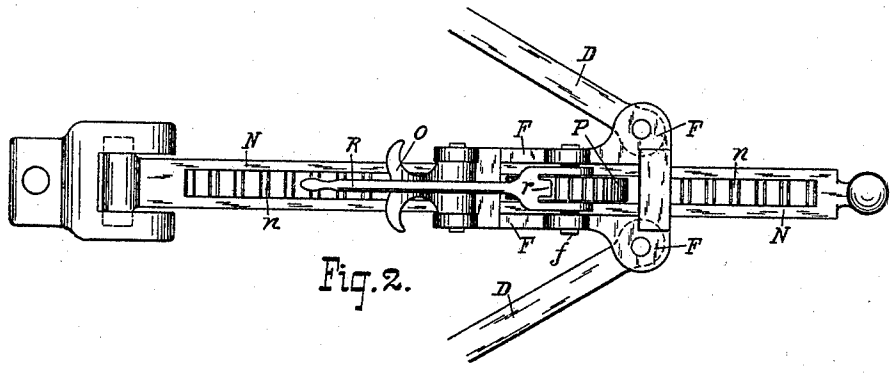

Fig. 2.

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Inventors
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(No Model.) 2 Sheets—Sheet 2.

J. DRADER & A. B. McKAY.

SPADE HARROW.

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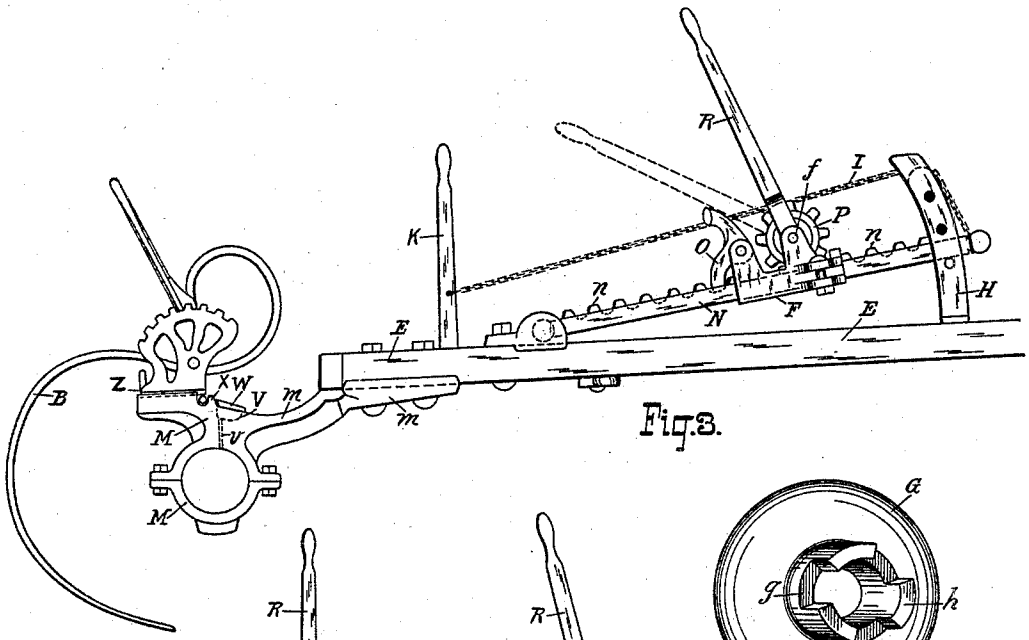

Fig. 3.

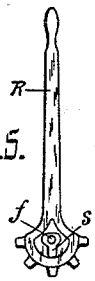

Fig. 5.

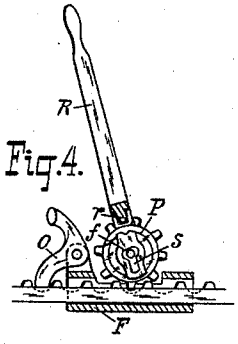

Fig. 4.

Fig. 6.

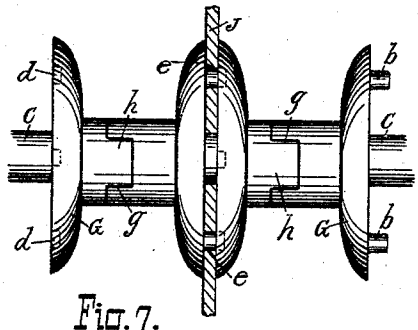

Fig. 7.

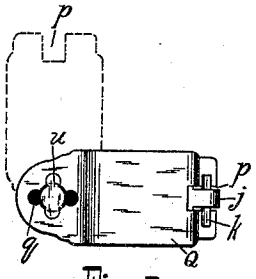

Fig. 8.

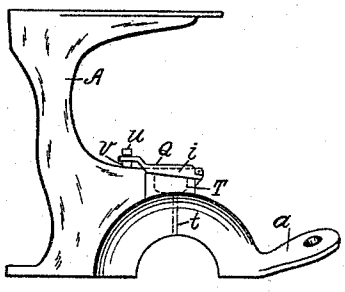

Fig. 9.

Witnesses
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UNITED STATES PATENT OFFICE.

JOSEPH DRADER AND ANDREW B. McKAY, OF LONDON, CANADA; SAID McKAY ASSIGNOR TO SAID DRADER.

SPADE-HARROW.

SPECIFICATION forming part of Letters Patent No. 487,322, dated December 6, 1892.

Application filed January 16, 1892. Serial No. 418,330. (No model.)

To all whom it may concern:

Be it known that we, JOSEPH DRADER and ANDREW B. McKAY, both subjects of the Queen of Great Britain, and both residents of the city of London, in the Province of Ontario, Canada, have jointly invented certain new and useful Improvements in Spade-Harrows, of which the following is a description.

This invention relates to improvements on a spade-harrow, and particularly to new and useful improvements on a spade-harrow or rotary plow for which United States Letters Patent No. 450,714 were granted and issued to us on the 21st day of April, 1891.

The object of this invention is, first, to counteract the downward inclination of the spade-spindles at their outer ends and to retain said spindles on a line with the ground and the spades an even depth therein, so that the ground will be worked evenly and to an equal depth throughout; second, to construct the bearing-box to which the tongue is secured in such a manner as not to require the reducing of the tongue in cross-section at its inner end; third, to secure the spades together by improved devices which will permit of their adjustment around a finer spindle than has heretofore been obtainable and at the same time when properly adjusted will hold and retain said spades in this established relation to one another; fourth and fifth, of providing improved devices for preventing sand or other impurities from getting into the lubricant-reservoirs which supply the bearings at the inner and outer ends of the spade-spindles.

These improvements consist, first, in forming the draw-braces vertically adjustable at their front ends and forming the bar to which the sliding block and draw-braces are secured pivotally adjustable; secondly, in forming a bracket-tongue support on the bearing-box which will support the tongue beyond the spades; thirdly, in dividing each collar which holds the spades in place into two parts and forming projections and corresponding recesses on the adjacent faces of these two parts into which said collar is divided, said projections and recesses having their lines of projection from the ends of the parts referred to and at right angles to the line in which they are rotating, and, fourthly and fifthly, in forming improved adjustable lubricant covers and devices for holding them in place.

In the accompanying drawings, Figure 1 is a plan view of our improved spade-harrow. Fig. 2 is an enlarged detail plan view of the pivotal bar and connections. Fig. 3 is a side view of Fig. 1 with the spade-spindles and draw-braces removed. Fig. 4 is a detail side view of the lever and connections, partly in section, which inclines the spade-spindles. Fig. 5 is a side view of a modification of the lever shown in Fig. 4. Fig. 6 is an enlarged detail perspective view of one part of one of the collars which hold the spades in position. Fig. 7 is a detail side view of several of same on a spade-spindle. Fig. 8 is an enlarged detail plan view of an adjustable lubricant-cover. Fig. 9 is an enlarged detail side view of the bracket which is situated at the outer end of each of the spade-spindles.

In the patent before referred to, J designates two gangs of curved spades, each being supported on a spindle C, the inner ends of which spindles are journaled in a bearing-box M, fixed to the tongue, while the outer end of each of said spindles is held by a draw-brace D, connected to a block F, slidingly supported on a plate N, fixed to the tongue E. In this patent just referred to the plate or bar N is fixed to the tongue E and the draw-braces are adjustable in a horizontal plane only to forwardly incline the spindles C. The first part of our invention consists in forming the draw-braces D vertically adjustable at their front ends and this bar N pivotally adjustable on said tongue E, so that when the machine is in operation the draw-brace D will have an upward draft on the outer end of the spindles C, for the purposes which will be presently described.

In order to obtain the best possible results in operating a spade-harrow, the spades J should be curved or inclined from the spindle C toward each of their ends, so that each spade will have a concave and a convex side, and they should also be placed on their respective spindles with their convex sides toward the center of the machine, as shown in Fig. 1, and the spindles C, which revolve with the spades J, should be inclined forward from

the center of the machine toward their outer end, so that the greater the curve of the spades J and inclination of the spindles C, as just described, the greater will be the resistance or pressure of the ground against the lower and concave side of the spades, because a greater portion of their lower and concaved side surface will be presented to the ground to turn it over. This increase of pressure against the lower and concaved side of the spades will cause them to enter the ground a greater depth. There will therefore be a greater excess of pressure against the lower concaved ends of the spades operating in the ground than on their opposite ends out of the ground, and also a greater pressure on their concave than on their convex sides. This excess of pressure on the lower portion of each spade and on the concave side acts as a lever, which draws the outer ends of the spade-spindles downward and throws their inner ends upward. The inner spades are consequently a less depth in the ground than the outer spades, and if this were not counteracted the ground would be worked unevenly. Now the effect of raising the front end of the draw-braces D is to counteract this action of the lower ends of the spades J operating in the ground, and said braces being connected to the outer ends of the spade-spindles C and their draft being upward they draw the outer ends of said spindles upward and bring the latter to a position in line with the ground. Each spade will thereby dig an even depth therein. Consequently the ground will be worked evenly and to an equal depth throughout; and again, the resistance of hard ground against the lower ends of the spades J will be greater than soft ground. Consequently the draft will have to be more upward in proportion to the hardness of the ground. This will require the draft at different elevations, so that the front ends of the draw-braces D require to be adjustable and will require means for adjusting them to and holding them at different elevations. As shown in the accompanying drawings, the means employed is a pivotal bar N, pivoted on the tongue E; but it may be pivoted on any other suitable support, and on this bar N teeth *n* are formed, and on the block F, sliding on this bar N, a dog O and toothed wheel P are pivotally secured and adapted to engage with the teeth *n* of said pivotal bar N. R is a forked lever, also pivoted on the block F and on the same pivot-bolt *f* as the toothed wheel P, which lever is formed with a tooth *r* and slot *s*. The dog *o* engages with the teeth *n* of bar N, and is for the purpose of holding the block F at any required point on the bar N to which said block F may be adjusted, and the lever R and toothed wheel P are for adjusting the block F lengthwise on the bar N. This is accomplished by engaging the tooth *r* with the toothed wheel P and turning it in the required direction. When the lever R has been moved as far as the surrounding parts will permit, the slot *s* therein permits it to be drawn outward until the tooth *r* clears the teeth of the toothed wheel P. The lever may then be moved back independent of the toothed wheel and the tooth *r* engaged with and take another grip on the teeth of said wheel and the latter again revolved. These adjustments of the block F, which is connected with the outer end of the spade-spindles C by the draw-braces D, incline said splindles forward at their outer end, which is required in order to get the best results from the spades. After the block F has been adjusted to the required position on the pivotal bar N the dog *o* is engaged with teeth *n* of said bar N. This relieves the lever R and toothed wheel P from all strain and wear. The lever may then be drawn outward, as before described, and rest in a horizontal position out of the way.

H designates a standard secured to the tongue E; I, a chain passing through a hole in the upper end of the standard H and connecting the outer end portion of the pivotal bar N with the resilient spring-lever K, the latter being pivoted on the tongue and by its resilience engaging with the notches in the bracket L. This chain I is attached to the lever K at such a point that by operating said lever K the outer end of the pivotal bar N will be instantly raised or lowered, as well as the front end of the draw-braces D, connected therewith. This will adjust the draft more or less upward on the outer ends of the spade-spindles C and regulate the upward draft according to the varying hardness of the ground, or for any other purpose required. The pivotal bar N may extend through a slot in the standard H, and pins passing through holes in this standard may be used to assist in holding the pivotal bar in any position to which it may be adjusted.

The bar N is shown and described as being pivotally adjustable. This we consider the simplest and most durable construction to assist in attaining the required result—viz., drawing upward on the outer end of the spade-spindles; but this bar N or the block F may be vertically adjustable, which would attain the same result, and the means consisting of the forked lever R and connections for adjusting the block F and attachments show the construction we have found most satisfactory for this purpose; but other constructions may be used. For instance, the lever formed with a slot *s* and a toothed segment on the lower end, as shown in Fig. 5, could be used in place of the forked lever R and toothed wheel P, or the lever R might be formed with a joint in one side and engage with studs on the side of the toothed wheel P, and, further, when inclining the draw-braces D upward we have found it preferable to construct the flange *a* on the end of the bracket A, to which the draw-braces D are attached, in an inclined direction forward and outward, as shown in Fig. 9, and heretofore in inventions of this class the tongue E has been secured directly to the

bearing-box M. To do this, it was necessary to cut the tongue E away on the under side at the inner end to give it the proper upward inclination forward, at the same time permitting the bearing-box M to remain horizontal, and, the tongue being so reduced at this point, flanges were required on the bearing-box M to strengthen the connection between said tongue and bearing-box; but to get the inner ends of the spade-gangs J sufficiently close together the space between these flanges was necessarily narrower than the tongue in cross-section. Consequently the sides of the tongue at the inner end were also reduced in cross-section to fit in between these flanges. This not only weakened the tongue at the inner end, but also the connection between the tongue and said bearing-box.

Our invention consists in forming a bracket *m* on the bearing-box M, which bracket extends forward beyond the spade-gangs J, and where said bracket extends beyond said gangs it is constructed wider and the tongue E secured thereto, and the tongue E being secured to this bracket *m* in front of the spade-gangs it will not be necessary to cut it down or to reduce it in cross-section in any way whatever, and this bracket is constructed with an upward inclination, so that when the tongue is placed thereon it will have the proper upward inclination, and this bracket *m* is formed with the recess *l* on the upper side to permit the most extreme adjustment of the spring-tooth B to free it from any obstruction on the ground, the bracket *m* being of sufficient length to prevent the upper part of said spring-tooth from interfering with the rear end of the tongue. This could not be accomplished when the tongue was secured directly to the bearing-box M; and by making this bracket *m* of cast-iron or other material it can be constructed of any required shape to permit any required adjustment of the spring-tooth or spade-gangs and still sufficiently durable to form a strong connection between the tongue and bearing-box, so that the forming of this bracket *m* as just described not only increases the strength and durability of the tongue and facilitates the working of the harrow, but at the same time lessens the cost of time, labor, and material in constructing spade-harrows; and in our patent before referred to the collar between each spade, which holds the latter in place, is divided into two parts, and these two parts are held together by an inclined or V-shaped connection. The tendency, however, in this form of a connection is for the inclined plane or V-shaped flange to move out on the inclined plane of the V-shaped recess and bear on the adjacent parts of the collars to spread them apart and cause considerable wear on said V-shaped connection; and when the spades are in operation they have a tendency to wear the adjacent faces of these V-shaped flanges, and while this would be but slight in each individual case in the aggregate it is sufficient to permit the V-shaped flange to move to a proportionate distance out of the V-shaped recess, thereby retaining only a short connection between the two, and the recess would be larger in cross-section than the adjacent portion of the V-shaped flange. This would permit the flange to vibrate and wear both itself and the adjacent face of the other parts of the collar in which the recess is formed until the V-shaped flange would be pressed out of said recess and one part of the collar slip past the other; and even before the parts of the collars slip past one another the difference in cross-section of the space between the V-shaped flange and the edges of the recess when the adjacent faces of these parts become worn would permit one part of the collar and spade connected therewith to turn in proportion to this difference in cross-section. This changes the original established relation of one spade to the other, which is very detrimental to the effective and perfect operation of the spades, each of which requires that the spades adjacent thereto will not enter the ground at the same time nor that the adjacent spade will be in such a position as to prevent the preceding spade from turning over its spadeful of earth. This is overcome and completely prevented by using our improvement, which consists in forming in the adjacent faces of the parts G G′ into which the collar between each spade is divided corresponding projections and recesses having the lines of projection from the ends of the parts G G′ and at right angles to the line in which they rotate. We carry out this construction, as shown in Figs. 6 and 7, by forming recesses *g* and corresponding projections *h* in the adjacent faces of the parts G G′ into which each collar is divided. The advantage of this construction is that if an unusual obstruction was brought to bear against any one of the spades J the latter would be retained in its original established relation to the others from the fact that the sides of the projections would abut directly against the adjacent parallel sides of the recesses and at right angles to the line in which the adjacent parts G G′ of the collars were rotating. Each spade J has two holes *e* made in it and two teats *b* are formed on the flange G^2 of one of the collars and fit into and through the holes *e* and into holes *d*, made in the flange G^2 of the next collar. This holds the collars and spades securely together.

While any number of corresponding projections *h* and recesses *g* may be formed in the adjacent faces of the parts G G′ into which said collars are divided, as described, we preferably form three recesses *g* and three projections *h*, as shown in Fig. 6. This, together with the teats *b* and holes *d* in the end flanges of the collars adjacent to the spades, enables the spades to be adjusted on the spindle C at the required angle to one another, so that two adjacent spades will not enter the ground at the same time, and also

adjusted so that one spade will not in any way interfere with or prevent the turning over of the ground by the adjacent spade; and, further, by constructing each collar in two parts G G′, and the adjacent faces of these parts being adjustable, this gives a finer and an additional adjustment of the spades to that of their adjustment on the end flanges G^2. Consequently a finer adjustment of the spades may be made by using our collar formed in two parts G G′ and constructed as just described than can be made where there is only the adjustment of the spades J on the end flanges G^2 of the collars.

T is a lubricant-reservoir formed in the bracket A, from which the lubricant is fed through passage *t* to the bearings supporting the outer end of the spindle C. Q is a flanged cover for this lubricant-reservoir, in the upwardly-inclined end of which the elongated slot *q* is formed, and the other end of said cover is downwardly inclined and an opening *p* formed therein. This cover is also formed with the side flanges *i*, which assist in retaining the lubricant in the reservoir T.

U is a stud-pin secured to the bracket A, and this stud-pin U is formed with an elongated head *u*, which head is fitted to the slot *q* in said cover Q.

On the front end of the lubricant-reservoir T is a flange *j*, in which a hole is formed, through which a pin *k* is inserted, and when the cover Q is in position this flange *j* projects up through the opening *p*. This pin *k* is then projected through the hole in the flange *j* above the downwardly-inclined edge of said cover and binds the cover Q on the reservoir T to prevent the accidental displacement of its contents. When the cover Q is in proper position over the lubricant-reservoir T, the elongated slot *q* therein will be at right angles to the elongated head *u* of the stud-pin U. This completely prevents the accidental displacement or loss of said cover; but when wishing to remove the cover it may be adjusted to the position shown by dotted line in Fig. 8. The elongated portion of the slot *q* will then come opposite the elongated portion *u* of the head. When in this position, the cover can be readily removed from the stud-pin U.

V is a lubricant-reservoir in the bearing-box M, from which the lubricant is fed through passage *v*′ to the boxes on the inner ends of the spindle C. W is the cover of this lubricant-reservoir, in which the notches *w*′ are formed, and X are studs on the bearing-box M, which fit perfectly free in the notches *w*′ of the cover W, which prevent its accidental lateral displacement.

Z designates the casting on which the spring-tooth B is pivotally secured, which casting rests on the bearing-box M and studs X and bridges the rear end of the cover and holds said rear end in place between the studs X and bearing-box M and at the same time permits the raising of the cover W to replenish the reservoir with lubricant.

Having thus described our invention, we claim—

1. The bar N, pivoted on the tongue E or other suitable support, and the block F, slidingly supported on said pivotal bar, and means for holding said pivotal bar and block at the positions to which they may be adjusted, in combination with the draw-braces D and spade-spindles C, substantially as shown and described, and for the purpose specified.

2. The bar N, formed with the teeth *n* and pivoted on the tongue E or other suitable support, the block F, slidingly supported on said pivotal bar, and the dog *o*, pivoted on said block, and means for adjusting said block F and adjusting and holding said bar N at the position to which they may be adjusted, in combination with the draw-braces D and spade-spindles C, substantially as shown and described, and for the purpose specified.

3. The combination of the pivotal bar N, formed with the teeth *n*, the block F, the dog *o*, the lever R, formed with the tooth *r* and slot *s*, and the toothed wheel P, in combination with the draw-braces D and spade-spindles C, substantially as shown and described, and for the purpose specified.

4. The standard H, the chain I, the lever K, and means for holding the latter at the position to which it is adjusted, in combination with the pivotal bar N, the block F, dog *o*, draw-braces D, and spade-spindles C, substantially as shown and described, and for the purpose specified.

5. The cover Q, in the upwardly-inclined end of which the elongated slot *q* is formed and having a downwardly-inclined end with the opening *p* therein, and the flanges *i*, in combination with the stud-pin U, having an elongated head *u*, fitted to the slot *q* in the cover Q, and the lubricant-reservoir T, formed with the flange *j* and pin *k*, substantially as shown and described, and for the purpose specified.

6. The cover W, formed with the notches *w*′, in combination with the bearing-box M, having a lubricant-reservoir V and passage V′ therein and formed with the studs X, and the spring-tooth casting *z*, substantially as shown and described, and for the purpose specified.

In testimony whereof we affix our signatures in the presence of the two undersigned witnesses.

JOSEPH DRADER.
ANDREW B. McKAY.

Witnesses:
P. J. EDMUNDS,
JAMES MAGEE.